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Kansas Edition

Areawide Stored Grain IPM

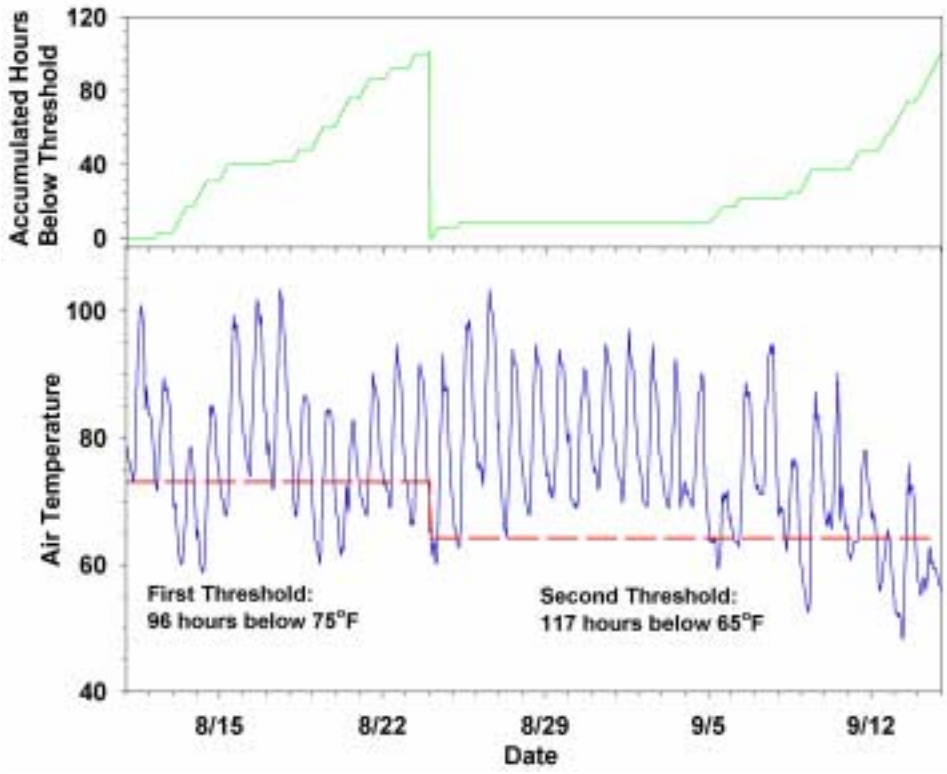
What We've Learned

The Area-Wide IPM Project is testing simple aeration controllers at several of the elevator locations. The devices have proven useful for maximizing insect control and minimizing aeration costs. The controller works by automatically turning on the fans when the outside air temperature is below a user-selected temperature threshold. This allows only the coolest air to be used during a cooling cycle.

Three, 29,000 bushel bins of wheat were cooled in 96 hours to an average of 74°F by August 23. The graph shows that during the first cooling cycle the threshold was set to 75°F. The controller automatically turned on the fans when the air temperature was below this threshold. The average air temperature, when the fans were operating, was about 70°F during August, 1999.

After the cooling front passed through the grain, the thermostat was reset to 65°F, this allowed cooler air to be used during September. Two bins of wheat were cooled to 66°F by September 15. During the second cooling cycle (117 hours), the average air temperature used for cooling was 59.5°F.

Insects do not have a chance to develop into troublesome populations when grain temperatures are reduced this early in the season, and fumigation will not be needed. In comparison bins, where aeration was not used, grain temperatures increased slightly, reaching an average of 82°F by September 20. Previous research has shown that insects develop rapidly at this temperature. The longer grain remains warm, the greater the chance insects will reach damaging levels, and that fumigation will be needed.



Automatic Aeration Controller

What we've learned

This table shows the pattern of grain cooling during the second cooling cycle, when the controller thermostat was set at about 65°F. In the first column, cooling had just begun, and a layer of grain at about 70°F (red block) was present near the bottom of the bin. After 78 hours, this layer had moved to near the top of the bin, and a layer of grain at 59°F (blue block) was evident near the bottom of the bin. After 117 hours, none of the grain was above 69°F, and the 59°F temperature front (blue block) had moved up to about the middle of the bin.

Thermocouple	9/8	9/13	9/16
15	73	69	69
14	70	69	69
13	70	**70**	68
12	72	**72**	65
11	70	**71**	66
10	69	69	65
9	69	69	62
8	72	69	**58**
7	72	68	**57**
6	69	65	64
5	**71**	64	65
4	**71**	68	66
3	**70**	62	66
2	72	**59**	66
Average Temp	71	67	65
Fan-Hours	14	78	117

Grain Temperatures (F°) during the second cooling cycle.

The cost of cooling this grain is calculated by converting fan horsepower to kilowatts, then multiplying by the hours of fan operation to determine kilowatt-hours (KwH). The average cost of electricity in the study area is about 6.5¢ per KwH. In this case, 20 hp fans were present on each 28,000-bu bin. Therefore, 15 Kw × 213 hours × 6.5¢/KwH = $207 per bin, or 0.7¢/bu. The cost to turn and fumigate is usually at least twice this amount.

Not all the cooling was this efficient. The fans on two bins that were controlled by the same controller as those shown above were left on longer than they should have been, which produced little additional grain cooling and increased electrical costs. When using automatic aeration controllers, it is important to monitor thermocouple cables and watch for the cooling front to completely pass through the grain. This is the best way to know when it is time to reset the controller to the next lower temperature threshold.

1999 was not a typical year in terms of grain temperature at harvest. Normally, wheat temperatures at harvest time are 15 to 20 degrees warmer than in 1999, making temperature reduction more dramatic during the first aeration cycle. At one elevator, 40,000 bu were cooled to 62°F by early November at a cost of 0.7¢/bu, and at another elevator more than 41,000 bu were cooled to 55°F at a cost of only 0.7¢/bu. Once grain temperature is below 68°F, most stored grain insects are unable to complete development, and eventually die.

GEAPS Meeting

Don't miss the upcoming GEAPS meeting in Kansas City Missouri on February 26–29. People involved in the stored grain areawide IPM project will be making a presentation on "Stored grain insect control in the 21st century" (Feb. 28, 9:15-10:15). The areawide IPM project will be introduced, and new information gathered from the areawide project will demonstrate how insect management can be improved in a way that will allow grain handlers to meet the challenges of the new century.

This should be an interesting session because some of the old ideas on controlling insects in grain elevators will be challenged. New control strategies will be presented, and the cost-effectiveness of the different methods will be discussed.

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Management team: David Hagstrum, Paul Flinn, Tom Phillips & Carl Reed

Scientists: Frank Arthur, Gerrit Cuperus, Alan Dowdy, Phil Kenkel, Mike Mullen, Ron Noyes, and Jim Throne

Coordinator: Sherry Craycraft

Tech. Manager: Skip Allen 316 728 0147

Technicians: Tyrone Baker, Clinton Bullard, Stana Collins, Loren Henson, Mary McCoy, Andrew Svoboda, and Ryan Rewerts